cities under the protection of visiting nursing associations; for various practical reasons they were not considered. If "straws tell which way the wind blows," it shows that some nurses somewhere are interested and are thinking very seriously about the question, even to the extent of joining the ranks, and discouraging as the situation seems, it becomes our duty as nurses to help in every way toward the solution of the problem.

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## INFECTION AND IMMUNITY

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In order to get a proper insight into the nature of infection and the processes of immunity, it is necessary to consider, in an elementary way at least, some of the principles of bacteriology.

The idea is prevalent that all bacteria are harmful, and therefore enemies to the comfort and existence of the human race. If you entertain such an opinion, I hope to disabuse your minds of the mistake, and on the contrary, to show wherein the large majority of them are truly benefactors to the animal kingdom.

Let us first get a clear definition of bacteria, that we may understand fully what is meant when we speak of them. The term includes the large group of minute vegetable organisms which multiply by transverse fission, and which are usually devoid of chlorophyl. The absence of chlorophyl in their composition separates them from the higher plant life, and causes them to seek organic matter for food and sustenance. We find a large variety of bacteria which subsist on dead organic matter. This class of organisms is called saprophytes. They are the benefactors to the human race above indicated. Strange as it may seem, without them our existence would be impossible. To elucidate this assertion, let me say that we cannot have decomposition, putrefaction, or fermentation, without their presence. They act as scavengers by removing from the earth deleterious substances that are inimical to health. They are the direct food producers for the vegetable kingdom, and the indirect food producers for the animal kingdom, in that they resolve dead animal and vegetable tissues into their end products, carbonic acid, ammonia, and water, which are taken up by the higher plant life and appropriated to its growth and development, thus furnishing food-stuff for man and the lower animals. Were it not for the sapro-

phytic bacteria, there would be a shortage in the supply of carbon and nitrogen to meet the demands of the chlorophyl plants, upon which the animal life depends, for the bounty of these elements, given off by the animal kingdom alone, is inadequate to serve the needs of the vegetable world, in order that, in turn, it may amply supply the animal needs. Here is a beautiful example of reciprocity between the animal and vegetable kingdoms. The kingdom of man might take a profitable lesson herefrom. Compensation seems to be a fundamental law of nature, which should not be ignored in our relations one to another.

But however interesting and profitable it would be to follow the life and conduct of the beneficent saprophyte, the organisms that most deeply concern us, as physicians and nurses, are the parasitic bacteria. This class of bacteria feeds upon living animal and vegetable tissues and takes therefrom substances, upon which the health of their host depends. You will observe from this that the parasites are the real enemies to animal and vegetable life, and by virtue of their growth and development form toxins which produce disease and death, hence you see clearly that the rôle which they play in nature is just opposite to that of the saprophytic type of bacteria.

In grouping bacteria, we speak of the spherical, the rod-shaped, and the spiral-shaped organisms. They are unicellular and always develop from pre-existing cells of the same character.

To these three grand divisions are given the names cocci, bacilli, and spirilla—the diameter of the isolated individual member of the first division, the coccus, is equal in all directions. This division is subdivided into the staphylococci, the streptococci, the diplococci, the tetrads, and the sarcinæ, so named from the nature of their growth, development, and manner of dividing. To the second division, the bacillus, belong all the oval or rod-shaped bacteria, in which one diameter is always greater than the other. The third division, the spirillum, comprises the thread-like bodies which are turned into spirals of greater or less curves.

Many of the bacteria possess the function of motility; especially is this true of the spirilla, less so with the bacilli, and still less so with the cocci. Many of them also possess the property of spore formation or resting stages whereby they can better resist deleterious influences than when in the vegetative stage. Under favorable environments these spores may develop into or revert to the same kind of cells from which they originated. They never multiply as spores, neither is one group of bacteria converted into that of another.

Bacteria grow and develop in the presence of organic matter of a neutral or slightly alkaline reaction, moisture, and a temperature

approximately from 15° to 120° (F.). Certain bacteria have peculiar affinities for certain stains, which aids us in determining the morphology and nature of the organism.

Infection is defined as "a contest between the pathogenic bacteria and living tissues, conducted on the part of the former by means of the poisonous products of their growth, and resisted by the latter through the agency of proteid bodies normally present and generated by the integral cell. Hence, when infection occurs, it may be explained, either by an excess of vigor of the bacterial products over the antidotal or protective, produced by the tissues, or to some cause that has interfered with the normal activity and production of these bodies."

By immunity, we mean the ability of the tissue elements to resist the bacterial toxins, however vigorous and active may be the parasite knocking at the portals for entrance. When such conditions prevail primarily, we call it "natural immunity." When an individual has recovered from certain forms of infection and is not susceptible to the same disease again, we term it "acquired immunity." Scrutinizing investigations have been made and numerous theories have been advanced to explain the *modus operandi* of immunity. It is not within the compass of this article to discuss all or many of them. We can notice only a few of the most important ones, which have led up practically to an accepted solution of the phenomena involved in the act.

The "retention" hypothesis of Chauveau suggests that in acquired immunity some bacterial products have been retained or deposited in the tissues which, by their presence, prevent the development of the same organisms, if they should subsequently gain access to the body.

Pasteur opposed this view by his "exhaustive" theory. He claimed that immunity was due rather to an abstraction from the tissues by the organisms that were concerned in the primary attack, of a something that is necessary to the growth of the infecting organism, should it gain entrance to the body at any subsequent time.

Metchnikoff's well-known doctrine of phagocytosis seemed to satisfy the profession at large, until Nuttall showed positively the part played by the leucocytes as not essential to the destruction of virulent bacteria in the blood of animals, but that the serum of the blood possessed this power, when quite free of cellular elements.

On this point, Bushner goes further, and claims that the activity of the serum alone, against bacteria, is greater than when the cellular elements of the blood are present. His explanation of immunity acquired by the tissues of the animal organism is that, in the primary infection from which the animal has recovered, there has been produced a "reac-

tive change" in the integral cells of the body, that enables them to protect themselves against subsequent inroads of the same organism.

From the foregoing investigations and discoveries, we are justified in concluding that in some way, an antibody or an antidote is formed in the body, which prevents the growth and development of the same class of bacteria after the primary attack, or after the system has been fortified by vaccination or by inoculation. Let these bodies be "Alexines," "defensive proteids," "globulins," "nucleins," or what not. With these authenticated facts before us, the physician and the nurse have increased responsibilities—for where much is known, more is required.

In the prevention of disease, the responsibility rests primarily on the doctor, and secondarily on the nurse, who is to execute his orders. She must be scrupulous in her methods of sterilization, disinfection, and antisepsis, while the doctor must be energetic in the use of prophylaxis against infection, and quick to administer antidotes to the toxins of the infecting organisms, if he would be abreast of the times. This is an era of preventive medicine, and the specific treatment of disease. Our biological chemists are on the alert to meet the demands of the medical profession for potent and efficient remedies, and their achievements are manifested in the excellent products that come from their laboratories, in the way of vaccines, bacterins, and antitoxins. Let doctors and nurses join in the hope that in the near future, the etiological relations of the micro-organisms to disease will be thoroughly known, and their toxins so well understood that their attacks may be forestalled by appropriate vaccines, and their ravages checked by specific antitoxins.

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## ORGANIZATION, OR WHY BELONG? *

By M. E. P. DAVIS, R.N.

In the summer of 1893, the World's Fair was held in Chicago to celebrate the four hundredth anniversary of the discovery of America. International congresses on art, literature, the professions, mechanics, and every achievement of man, manual or intellectual, were held in sections or subsections. One of these, Section No. 3, was the International Congress of Charities, Corrections, and Philanthropy, a subsection of which was devoted to Hospitals, Dispensaries, and Nursing. The chair-

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